

NIOSH Construction Research Program
Implementation of the National Academies'
Program Evaluation Recommendations:
*A Report to the NIOSH Board of Scientific
Counselors*

August 2012

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Introduction

The NIOSH Construction Program review by the National Academies was conducted during 2007-2008. The review focused on construction research and related activities conducted by and through NIOSH during 1996 -2006. At the conclusion of its review, the National Academies' committee assigned a score of 5 for relevance on the basis that the research was judged to be high priority in nature and that the Program was significantly engaged in appropriate activities that transferred research findings to practice in the construction trades and on construction sites. The committee assigned the Program a score of 4 for impact on the basis that NIOSH had made some contributions to construction health and safety as measured by either end outcomes or well-accepted intermediate outcomes. Committee members diverged, however, on whether these contributions could be classified as major contributions across the entire program.

The committee recommended improvements for the Construction Program, presented formally in six recommendations to NIOSH. The six formal recommendations were:

- (1) Research-to-Practice (r2p) efforts should involve individuals with training or with the experience and skills to create strategic diffusion and social marketing plans for National Institute for Occupational Safety and Health research and to evaluate such plans' effectiveness.
- (2) Consideration should be given to having the majority of research-to-practice efforts of the Construction Research Program conducted through the National Construction Center.
- (3) High-level attention should be given to determine how to provide program resources that are commensurate with a more robust pursuit of the Construction Research Program's goals.
- (4) The Construction Program Coordinator and the Construction Program Manager should both be devoted full-time to the Construction Research Program.
- (5) The National Construction Center should continue to be used as an important component in the Construction Research Program.
- (6) The Program should establish a closer connection with the Occupational Safety and Health Administration and other regulatory standards organizations to help ensure that the Program's research is applied effectively in rule-making efforts.

On August 26, 2009, the Construction Program presented to the NIOSH Board of Scientific Counselors (BSC) an initial implementation plan responding to the National Academies' recommendations. The BSC commented on the NIOSH plan and also provided an additional recommendation:

The BSC recommends an increased focus on developing a specific R2P plan for construction in conjunction with the National Construction Center, the NORA Construction Sector Council and OSHA. The plan should focus on those areas where

causes of injuries, illnesses and fatalities are known and solutions have been identified and are readily available. Dramatic impacts could be achieved in a relatively short time period.

In this *Report to the NIOSH Board of Scientific Counselors*, the Construction Program at NIOSH summarizes its progress and impact in implementing five of the six recommendations made by the National Academies, and addresses an additional Board of Scientific Counselors' recommendation mentioned as well. The rationale for selecting the five recommendations for the Implementation Plan include: (a) the selected recommendations address high priority issues for construction within NIOSH, including its intramural and extramural activities; (b) several of the recommendations encourage the Construction Program to foster continued collaboration with established partners, and aid in identifying new partners with whom expansion, enhancement and improvement of NIOSH's construction research and dissemination could take place; and (c) the selected recommendations afford an opportunity to showcase the impact that the NIOSH Construction Program has had in recent years.

The explanation for excluding from the *Report* one of the six recommendations appears in the Appendix. The recommendation numbers in this report are those used in the National Academies report.

RECOMMENDATION 1

Efforts to influence practice based on research (“research-to-practice” or r2p) efforts should involve individuals with training or with the experience and skills to create strategic diffusion and social marketing plans for the National Institute for Occupational Safety and Health research and evaluate such plans’ effectiveness.

Background

Status: *In Progress*

External Factors: None

Implementation of Recommendation

The NIOSH Construction Program noted in its August 2009 initial implementation plan report to the BSC that it would interact with the reorganized NIOSH r2p team to improve access to expertise and resources for enhancing r2p in the Construction Program. NIOSH responded also that the new cooperative agreement award for the national construction center (fiscal years 2009 to 2013) would have a specific focus on r2p. NIOSH has enhanced its research-to-practice efforts, especially in construction, based on the National Academies’ and BSC’s recommendations.

Activity A: Construction Dissemination Assessment

Description: NIOSH identified research-to-practice as a priority in 2004. The aim has been to ensure that NIOSH-generated research is relevant to acknowledged needs and is used by organizations to improve worker safety and health. The NIOSH Construction Program used a public health practice study conducted during 2009-2010 to examine previous dissemination practices for eleven NIOSH numbered publications addressing construction industry topics. The purpose of the study was to assess past practice over the previous decade and to provide practical guidance to improve targeted dissemination and transfer of research findings to workplace practice. The study examined web hits, use of mailing lists, and collaboration with organizations that provide information to the construction industry.

Progress: The study provided useful recommendations for improving diffusion of research materials to the construction industry. These included development of a NIOSH master construction contact list, involvement of partners in dissemination, and more active dissemination of reports and research products. These recommendations were shared with the National Construction Center, and were used to inform additional r2p planning.

NIOSH’s Office of Extramural Programs receives qualitative and quantitative information on dissemination outputs annually from the National Construction Center. A list of dissemination outputs, in various forms and types of distribution, is shared regularly with NIOSH researchers.

Also, NIOSH and the National Construction Center discuss dissemination strategies and coordination at their regularly scheduled meetings.

Impact: Beginning in 2011, both the study on dissemination and the efforts by the National Construction Center shaped efforts to disseminate outputs from NIOSH's construction program. It is now standard practice to use social media and to involve the National Construction Center, and OSHA where relevant, in dissemination efforts.

Future Plans: a review of the impact of social media will help determine if adding outlets will be worthwhile. Dissemination of materials in Spanish and other languages as a standard approach is possible.

Activity B: Developing New Diffusion and Social Marketing Infrastructure

Description: The FY2009-2013 request for applications (RFA) for a national construction center included an objective to provide national leadership and coordination on research-to-practice (r2p) to effectively transfer research findings to construction stakeholders. Specifically, the RFA detailed a need for: (a) translating research recommendations and outputs for use by consensus organizations, regulatory agencies, professional associations, and construction employers, unions, and workers; (b) facilitating the adoption of or hastening the transfer of research recommendations and outputs, technologies, and information into practice or to worksites; and (c) expanding the body of knowledge about r2p in the construction sector.

NIOSH RFAs focus on research activities, limiting the ability to direct and support broader non-research r2p activities that can be considered critical to meaningful dissemination and marketing of research outputs in the construction sector. While these important activities are within the scope of the objectives for the national construction center, there was a gap in both funding and mechanisms to support them. This gap became recognized increasingly by external practitioners as an important public health shortcoming as well, as exemplified in a late 2009 commentary by Kreuter and Bernhardt. Their review of public health programs indicated a "near total absence of systems and infrastructure for marketing and distribution".¹ This capacity gap was evident in construction program activities and represented a fundamental obstacle in making an impact to improve construction safety and health.

Progress: The newly formed Office of Construction Safety and Health, established in December 2009, evaluated options for improving this situation as NIOSH began to conceive of a separate r2p announcement for construction. In their review, the National Academies committee noted that NIOSH had robust mechanisms in place to solicit, process, review, score, and fund research

¹ Kreuter, MW, and Bernhardt, JM. Reframing the Dissemination Challenge: A Marketing and Distribution Perspective. *Am J Public Health* 2009;99:12:2123-2127.

projects, but not comparable mechanisms to ensure that evidence-based research results were marketed, disseminated and implemented to influential intermediate construction organizations and end-users to the fullest extent possible. In 2010, the NIOSH Director made funds available (for four years) for a special announcement requesting applications, through the Office of Extramural Programs, for research topics in construction aimed at deriving impacts from r2p endeavors, including r2p dissemination, distribution channels, marketing, coordination strategies, and other activities not specifically identified in the previous national construction center RFA. The purpose of the special announcement was to address this gap, to support and expand r2p activities for the current cooperative agreement projects, and to better align the NIOSH Construction Program with the National Academies recommendations. CPWR—The Center for Construction Research and Training, which was competitively selected to be the National Construction Center for fiscal years 2009-2013, was competitively selected also for the special r2p funding.

With specific resources in place at the National Construction Center, efforts began to build additional r2p infrastructure. CPWR hired an r2p Director (see Activity C in the next section). A standing r2p meeting was initiated in 2011 involving the National Construction Center, the NIOSH r2p Office, the Directorate of Construction at the Occupational Safety and Health Administration (OSHA), and the NIOSH Office of Construction Safety and Health (OCSH) to design and implement specific r2p activities for the building and construction trades and contractors based on NIOSH and/or CPWR research and OSHA policies. See next section for additional information.

Impact: The emphasis on r2p in the construction sector at NIOSH has afforded the initiation of several activities that have been critical for improving safety and health in construction. These include:

- The NIOSH and Occupational Safety and Health Administration (OSHA) co-branded and co-published Nail Gun Safety: A Guide for Construction Contractors (<http://www.cdc.gov/niosh/docs/2011-202/>). OSHA printed 50,000 copies initially in September 2011, and has almost exhausted a second printing of 50,000. The number of downloads from the OSHA website is not available at this writing.
- Outreach through social media, specifically, Twitter, has been important. As of July 26, 2012, there were 4,758 followers for Construction@NIOSH. Seven Nail Gun Guide launch-related tweets on the NIOSH Construction Twitter site generated 1,539 hits to the NIOSH topic page on the subject. As of the end of July 2012, 1,986 hits to the NIOSH topic page have come directly from the NIOSH Twitter site. The topic page also allows one to “recommend” on Facebook; 32 such “recommends” have occurred to date.
- The Guide has been a real help to the construction industry. As late as July 2012, members of an important construction stakeholder organization, the Associated General Contractors of America (AGC), expressed their pleasure with the document. In fact, one

contractor called it the best document he has ever received from the [federal] government, and said that he has made it required reading for all of his staff.

Future Plans: The additional r2p infrastructure, and coordinated efforts among NIOSH, the National Construction Center and OSHA, will be used for future dissemination and diffusion activities of materials from the construction falls prevention campaign and the Spanish version of the Nail Gun Guide.

Activity C: Involving Individuals with Strategic Diffusion and Social Marketing Skills – Part 1

Description: CPWR hired Robin Baker, MPH, Director, Research to Practice at the Center for Occupational and Environmental Health at the University of California-Berkeley, to bring her considerable skills in advancing practical applications based on research to this area of focus within the National Construction Center. Later the National Construction Center hired Eileen Betit for supporting diffusion and social marketing activities relating to special projects, and Linda Goldenhaar for assisting in dissemination activities resulting from intervention research.

Progress: Ms. Baker initiated a number of activities to improve r2p capabilities at the National Construction Center with NIOSH and for the construction sector generally. She met with NIOSH and CPWR staff and the NORA Construction Sector Council to discuss priorities and strategies. Over an 18-month period (fall 2010-spring 2012), she then worked with CPWR and NIOSH to initiate or facilitate several activities including:

(1) Created a coordinated r2p effort involving CPWR, NIOSH and OSHA including regular meetings to enhance the development and implementation of high priority r2p projects.

(2) (a) Designed and conducted a strategic r2p review of completed CPWR-sponsored construction research. Identify those research projects with the greatest potential to reduce injury and illness and which have other strategic impacts through development and validation of an r2p checklist (“triage tool”) specific to the construction industry, and then set priorities among these projects for dissemination efforts.

(2) (b) Development, implementation, dissemination and/or marketing plans for those programs, products, interventions and other research results meriting diffusion using the process. The first three projects have been identified and initiated:

- Broad dissemination of nail gun safety information
- Creation of a silica safety information website for both workers and contractors
- Improving technology transfer opportunities to bring safety innovations in construction to market. The Best Practices for Health and Safety Technology Transfer in Construction Workshop was held on May 31, 2012

(3) Developed a master construction database to provide construction contact information for diffusion and dissemination.

(4) Enhanced r2p plans for current construction research projects by creating project-specific r2p “roadmaps.” The conceptual “roadmap” was designed to guide the development of dissemination plans as an integral and proactive part of the research process.

(5) Prepared new resources (“r2p tool kits”) and other materials that contribute to a more comprehensive national system for effective information transfer, and make them available through CPWR’s website (<http://www.cpwr.com/r2p/index.php>). Resources now include a guide to effective use of social marketing in occupational safety and health, and a guide to the effective use of training outlets to promote safety innovation.

(6) Enhanced National Construction Center communications through development of a CPWR electronic newsletter and a CPWR Facebook page, the latter of which currently has over 5000 friends.

(7) Promotion is ongoing for the effective use of private and public partnerships that include labor, contractors, government, owners, manufacturers and other stakeholders to implement multi-faceted, evidence-based interventions in the construction industry. Partnership case studies (e.g., the asphalt partnership) were conducted and a report produced. A new Masonry Industry Partnership has been created to help distribute information to and get feedback from that industry component. Partnership with two Latino groups facilitates distribution of the Spanish version of the falls prevention campaign materials.

(8) Consultation on dissemination and diffusion plans for ongoing projects with ready outputs.

(a) Development and implementation of dissemination and diffusion for the national construction falls prevention campaign.

(b) Development of evaluation scheme for the national construction falls prevention campaign.

Impact: Having Ms. Baker fully engaged provides the experience and skills to create strategic diffusion and marketing plans for CPWR. The two later hires demonstrate their greater commitment and potential impact. It positions CPWR to take a leadership role in providing resources and assistance across the NIOSH Construction Program. This work is already underway. The master construction database, the r2p review of CPWR-sponsored research, the silica safety website, and the technology transfer workshop have been embraced, scheduled, and completed as a direct result of these hires and other investments by the National Construction Center.

The silica safety website is expected to go live in August 2012. DC metropolitan area contractors, contractor associations, labor, and labor representatives participated in focus groups

from which information was used to craft the site. A soft launch of the website has taken place, and CPWR has received favorable feedback. Limited outreach in New Jersey was very well received. The technology transfer meeting was well-received, and information from it is being compiled into a report. Next steps also include developing tools for construction stakeholders on how to develop a business case, and on how to prepare for patents and licensing, for example.

Future Plans: CPWR-OSHA-NIOSH Database Outreach Resource (CONDOR) is a unique tool developed by the CPWR r2p group, to disseminate information on critical health and safety innovations in construction. The database includes contact information for thousands of construction contractors, government officials, health and safety professionals, university-based researchers, labor representatives, trade press contacts and others. With CONDOR, targeted email, telephone or mail distribution networks can be prepared and distributed in order to get critical information to the right audiences, regardless of size. One of the goals of this effort is to build a communications infrastructure that allows for more efficient, broad dissemination and adoption of evidence-based solutions in the construction industry. Building an effective contact database is an essential element of this system.

The triage review of existing projects identified two focus areas for follow-up: Nail guns, for which additional products and evaluation are planned, and silica, for which a one-stop website for contractors is under development. Additional evaluation efforts are planned related to the NORA Construction Sector-initiated construction falls prevention campaign (2012-2014) which is described in a later section.

In future years, the synergy of intervention research findings and the r2p program at the National Construction Center will make for state-of-art strategic diffusion and practice.

Activity D: Involving Individuals with Strategic Diffusion and Social Marketing Skills – Part 2

Description: In an effort to support this objective, NIOSH's research-to-practice (r2p) office in January 2010 was renewed and realigned as a team within the Office of Health Communications. Staff with expertise in social marketing and diffusion is housed on the team. Also, Ms. Pietra Check, MPH, who is a member of the NIOSH Communication and Research Translation Office (Washington, DC location; formerly Office of Health Communications and Research to Practice Office), was assigned a portion of her time to work with OCSH on construction sector activities to assist with general communications activities and r2p planning.

Progress: The Office of Construction Safety and Health has strengthened its r2p and communications internally by better-defining its relationship with the NIOSH Communications and Research Translation Office (CRTO). The NIOSH Construction Program depends on two individuals from CRTO to act as points of contact and consultants who provide guidance on r2p, marketing, dissemination, and other communication issues for specific Construction Program needs and strategic directions. This formalized relationship allows the Construction Program to be proactive about addressing communication and r2p needs in a timely manner as opportunities

arise. CRTO also contributed expertise in designing the Nail Gun Guide, and with a campaign to prevent falls in construction, described later.

The NIOSH Construct Twitter site was launched in April 2011 and by June of 2012 had over 4500 followers. The NIOSH OCSH and CPWR coordinate efforts to post timely announcements on both Twitters and Facebook, respectively. We have often coordinated with OSHA also to tweet their construction information because they do not have their own Twitter presence.

Implementation of Additional NIOSH Board of Scientific Counselor December 2009 Recommendation:

The BSC recommended an increased focus on developing a specific research-to-practice plan for construction, and specified that it be developed in conjunction with the National Construction Center, the NORA Construction Sector Council and the Occupational Safety and Health Administration (OSHA). The BSC recommended that the plan focus on those areas where causes of injuries, illnesses and fatalities are known and solutions have been identified and are readily available.

This recommendation is discussed below, and it is relevant as well to National Academies' recommendations 2, 5, and 6. The NIOSH Construction Program has strategically engaged the NORA Construction Sector Council, OSHA, and the National Construction Center to target three specific areas for r2p emphasis. These are nail guns, falls, and green construction.

Progress on Nail guns: A decade of NIOSH-funded research by CPWR consortium member Dr. Hester Lipscomb identified key risk factors associated with nail gun use, and demonstrated the effectiveness of trigger and training interventions. This information, however, was not being adopted by nail gun manufacturers or users. Furthermore, there were no OSHA regulations explicitly addressing nail guns. In response to these practice gaps, the issue was brought before OSHA's Advisory Committee for Construction Safety and Health (ACCSH), and a work group was formed to study the issue. NIOSH worked with the work group co-chairs to arrange for presentations by Dr. Lipscomb so that she could share study findings. ACCSH eventually passed a unanimous motion asking OSHA to develop guidance and/or regulations.

In addition, the NORA Construction Sector Council's goals related to "struck by" incidents addressed preventing these injuries by developing guidance. NIOSH took the lead role in working with OSHA to create co-branded guidance for contractors.

The NIOSH-OSHA co-branded document, "Nail Gun Safety: A Guide for Construction Contractors" (<http://www.cdc.gov/niosh/docs/2011-202/>) was released in September of 2011. The publication provides the latest information on how nail gun injuries occur; worksite accounts on actual nail gun incidents; specific training recommendations; and practical advice that contractors can use to prevent nail gun injuries. A decade of NIOSH- and CPWR-funded research, identifying both the problem and effective interventions, was used substantially in the

publication. Expertise in both research and communication was used to customize content for the target audience. For example, the Guide used sidebar sections to provide both key research findings (“You should know”) and actual cases (“Worksite story”) to help convey key messages. A strategic diffusion and marketing plan was developed based on the National Academies’ recommendations regarding active dissemination. A dissemination plan was designed cooperatively by the National Construction Center, OSHA Directorate of Construction, the NIOSH Communication and Research Translation Office, and the NIOSH Office of Construction Safety and Health.

Impact: By design, most requests for the publication were routed through OSHA and NIOSH websites, respectively. As a result of effective dissemination efforts, the Guide received over 108,000 unique visitors at the OSHA website containing information about the Guide, and over 5000 unique visitors at the equivalent NIOSH website. Also, NIOSH, OSHA and CPWR partnered to present a nail gun safety webinar under the auspices of the American Society of Safety Engineers (ASSE). As part of the diffusion plan, a dedicated nail gun safety website (www.nailgunfacts.org) was launched a month later to provide additional videos, worker testimonials, and news reports about nail gun injuries, training resources, and research information to construction audiences. The website was developed and launched by CPWR Consortium researcher Hester Lipscomb at Duke University and her carpenter colleagues. The site is funded by the National Construction Center.

Future Plans: Additional diffusion efforts are planned for 2012.

- NIOSH will publish the Spanish translation of “Nail Gun Safety: A Guide for Construction Contractors” in the fall of 2012.
- Additional materials designed for workers, and based on much of the same research as the “Nail Gun Safety: A Guide for Construction Contractors,” will be published by NIOSH and CPWR in 2012.

Progress on Falls: Under the auspices of the NORA Construction Sector Council, a campaign to prevent falls among construction workers was developed. The Sector Council identified the campaign as one of two goals on which to focus, selected from among its 15 strategic goals. The scientific underpinnings of the campaign were prepared during 2010-2011 by Sector Council members working in groups. The National Construction Center and OSHA, both of which are represented on the Council, played key roles in developing the campaign. Using a small amount of resources within its budget, the NIOSH Office of Construction Safety and Health hired a social marketing expert to prepare an environmental scan and a social marketing plan. Because the campaign relies heavily on completed research, it is a major r2p endeavor. The National Construction Center hired the same social marketing expert to conduct focus groups, thus investing in these additional skills and experience. The national construction falls prevention campaign, a remarkable Sector Council accomplishment, was launched on Workers Memorial Day on April 26, 2012 by U.S. Department of Labor Secretary Hilda Solis.

The National Construction Center is taking a lead role in the construction falls prevention campaign by co-leading the effort under the auspices of the NORA Construction Sector Council; by being involved in every facet of the campaign development; by steering the design of and funding for the focus group research used to design the campaign. The Center also agreed to host the non-government principal web presence supporting the campaign (<http://www.stopconstructionfalls.com>) and inquiries about the campaign through e-mail (falls@cpwr.com).

Impact: At this writing, evaluation metrics are being finalized, but the National Construction Center is designing a full evaluation plan. Other metrics of interest are visits to websites designed to support the construction falls prevention campaign. As of June 29, NIOSH had 2500 visits to its www.cdc.gov/niosh/construction/stopfalls.html. The National Construction Center at CPWR hosts the main web presence supporting the campaign (www.stopconstructionfalls.com) as well as inquiries about the campaign through e-mail (falls@cpwr.com). As of June 29, CPWR has experienced 23,208 website views (8,399 unique visits) to www.stopconstructionfalls.com and 111 e-mail inquiries. For the print materials, OSHA has distributed 12,800 posters and 10,500 fact sheets in English, and an equal number of each in Spanish. A Facebook page was developed for the campaign by a NORA Construction Sector Council member at Washington University School of Medicine in St. Louis. There have been over 15,000 visits to the site (8,479 unique visits) as of July 3.

Future Plans: The construction falls prevention campaign is expected to continue distributing information and provide outreach through the fall of 2013.

Progress on Integrating Safety and Health into Green Construction: One of the 15 NORA Construction Sector Council goals relates to green construction (Goal 13.0: Increase the use of “prevention through design (PtD)” approaches to prevent or reduce safety and health hazards in construction). The Sector Council narrowed its focus to this (and one other) goal to accelerate progress (a fuller explanation is provided on page 19). “Prevention through Design” (PtD) has been the linchpin of NIOSH’s efforts to integrate occupational safety and health into green and sustainable construction. The NIOSH Construction Program, and particularly the Office of Construction Safety and Health, has taken a number of key steps to advance this issue. The program helped articulate the case for why green construction represents an opportunity to promote worker safety and health as a fundamental dimension of true sustainability. For example, an entry to NIOSH’s Science Blog, “Going Green: Safe and Healthy Jobs” (<http://blogs.cdc.gov/niosh-science-blog/2010/01/green-2/>) was published in January of 2010 following the NIOSH “Making Green Jobs Safe” Workshop. Additional outreach to the safety and health community has been performed by organizing several roundtables and presentations at national and regional conferences.

In addition, NIOSH formally approached the U.S. Green Building Council (USGBC) in February 2011 about the merits of integrating occupational safety and health generally, and PtD

specifically, into its Leadership in Energy and Environmental Design (LEED) rating system. NIOSH, with colleagues from the NORA Construction Sector Council, prepared a "credit-by-credit" review of the 2009 LEED credits, and identified six credits that could be enhanced by inserting additional language to the credit to address safety and health. Additional reference material was also developed. NIOSH shared these materials with USGBC in 2011 and is working with them on strategies to incorporate safety and health into LEED as the rating system evolves to LEED version 4.

Impact: The NIOSH Construction Program views this as an important initiative that will take time to deliver results. The Program has established a working relationship with the USGBC and we expect this to provide insights and perspectives on how best to move ahead. This effort faces many challenges such as the lack of architect, designer or owner involvement in safety. The USGBC itself is in the process of rethinking its approach to several issues as it updates the most recent version of LEED, which was originally scheduled for 2012, but has now been delayed until late 2013. Since the USGBC's LEED is the most widely used rating system in green construction, it makes our discussions with USGBC prodigious.

Future Plans: The USGBC is working with NIOSH to outline other modes by which the USGBC stakeholders can become knowledgeable about the merits of integrating occupational safety and health into other LEED credits (e.g., June 26, 2012 seminar on integrating occupational safety and health into LEED by Christine Branche and Matt Gillen to USGBC headquarters staff in Washington, DC).

The NIOSH Office of Construction Safety and Health is working through the NIOSH Office of Global Collaborations to engage the World Health Organization (WHO) Collaborating Centres in Occupational Health and the Pan-American Health Organization (PAHO) in their growing interests in sustainability, and their wish to see occupational safety and health included.

RECOMMENDATION 2

Consideration should be given to having the majority of research-to-practice efforts of the Construction Research Program conducted through the National Construction Center.

Background

Status: *In Progress*

External Factors: None

Implementation of Recommendation

In its December 2009 response, NIOSH's Construction Program responded that while the National Construction Center would have a major focus on r2p, "NIOSH must continue to assume responsibility in this area as well." NIOSH indicated, furthermore, that all intramural research projects must include r2p plans in every phase.

Activity A: Shift Research-to-Practice Efforts in Construction to the National Construction Center

Description: Since submitting the response to the BSC in 2009, NIOSH has considered thoroughly its r2p activities and the proper place for them. With its award of the special construction r2p funding through 2014, the National Construction Center was required to specifically design r2p dissemination, distribution channels, marketing, coordination strategies, and other activities not specifically identified in the previous national construction center request for applications. Hence, NIOSH has executed steps that shift r2p activities to the National Construction Center. This r2p shift places a much greater responsibility for r2p in construction for NIOSH on the National Construction Center, thus fulfilling the recommendation from the National Academies.

The primary objective of the r2p in construction funding is to ensure that evidence-based research results are marketed to, disseminated to, and implemented by influential intermediate construction organizations and end-users (e.g., construction companies, labor unions, and organizations offering training to construction workers). In making the specific construction r2p funding available, NIOSH identified the following priority research impact topics:

- Conduct an impact review of all ongoing research project outputs given that earlier NIOSH-funded research projects were designed to contain an r2p element. The National Construction Center was required to include triage questions and a triage process for identifying those research projects with impact potential or construction audience interest that merit additional strategic follow-up.
- A Dissemination Planning and Tracking Tool that will help prepare marketing plans, and help promote research-tested interventions.
- Build distribution and support capacity (e.g., web portals, online databases and repositories, inventories, and partnerships) to support enhanced dissemination and transfer of information products).
- Establish evaluation measures and processes that will be routinely applied.

- Coordinate with the NIOSH Construction Program and contribute to r2p efforts across all NIOSH-funded construction research. While the primary focus of this funding is to support and expand r2p activities for current cooperative agreement projects, there is a need for program-wide collaboration on r2p. A portion of the funding, therefore, is being directed to support r2p activities for at least one recently completed intramural applied research project (i.e., internal NIOSH) and one other extramural project over the duration of the supplemental support period.

Progress: Much of the progress on this Activity is discussed under Recommendation 1, Activity C (page 8). Additionally, a work group has been formed within the NIOSH Communications and Information Dissemination Cross-Sector Program with a plan to use the Tool and determine how it can be adapted and applied generally at NIOSH.

The distribution and support capacity component of the construction r2p project is underway but not complete. Beginning in FY2010 to present and through a series of administrative requests, however, NIOSH approved the National Construction Center to increase expenditures for construction r2p program development activities, data and other information collection, and communication and marketing materials in order to achieve accelerated capacity (e.g., formative research) and impact for construction r2p.

Impact: CONDOR, described in Recommendation 1, Activity C, was formed to assist with active dissemination. Also, in September 2011, CPWR launched a monthly electronic newsletter, *CPWR Update*, providing another outlet for disseminating research findings and practical applications.

Future Plans: The National Construction Center will launch a website on silica safety, Silica-Safe, in 2012. The website is intended to be a repository of silica information for both workers and contractors.

Activity B: Research-to-Practice Efforts through other NIOSH Extramural Funding

Description: NIOSH uses extramural funds to support investigator-initiated and other university-based research in the construction sector. Fortunately, many projects have research-to-practice elements that have had positive impacts on construction in the United States. There are several projects underway, but a few are described as examples here.

Progress and Impact:

Hearing Loss. Researchers at Virginia Polytechnic University (Virginia Tech) conducted a study to reduce impediments to speech communication and signal detection in the construction industry. The work included an evaluation of commercially available hearing protection devices, including audible speech and perception of direction warning signals from heavy equipment used in the construction industry. The research has implications for hearing protection in the construction industry, as well as signal detection and signal localization. Findings of this laboratory and field research were presented to the National Academies

(http://www.nap.edu/openbook.php?record_id=12928&page=167 and http://www.nap.edu/openbook.php?record_id=12928&page=42) in their assessment of hearing loss research for NIOSH. The findings of this research have been shared with standard-setting organizations in an effort to encourage the revision of the backup alarm standard in an effort to further reduce the incidence of runovers in construction.

Workforce Development. Researchers from Purdue University have been educating future engineers and construction safety personnel through the long-term study of nighttime construction operations on highways. The study was conducted in cooperation with the Indiana Department of Transportation.

Future Plans: Based on discussions with NIOSH's Office of Extramural Programs, an emphasis on r2p will continue to be a key feature of future funding announcements for a national construction center.

Activity C: Research-to-Practice (r2p) Activities within NIOSH

Description: Even with an emphasis on r2p for construction at the National Construction Center, construction-related research and r2p are underway within NIOSH divisions. Assistance with r2p is provided by the NIOSH Communications and Research Translation Office (CRTO). The Office of Construction Safety and Health also provides researchers with ideas on target audiences, partners, and active dissemination. It also facilitates referrals to the National Construction Center. The meetings among NIOSH, CPWR and OSHA for r2p occur roughly every two months and are used also to brainstorm ideas with researchers.

Progress and Impact: Several pivotal projects are worthy of note:

Protection for roofers: Researchers within NIOSH's Division of Safety Research (DSR) designed, developed, and patented (*U.S. Patent No. 7,509,702*) a multi-functional guardrail system that can be used on numerous residential and commercial-industrial work sites. This guardrail system is capable of providing protection to personnel who must work near (1) unguarded roof surfaces—flat and seven different residential slopes, (2) unguarded skylights, (3) unguarded roof and floor holes, and (4) on stairs that have not yet had handrails installed. The fall-prevention system was designed to meet all OSHA safety requirements for guardrails. During 2009-2011, NIOSH discussed with eight companies the potential to partner and commercialize this system. During June 2011, an exclusive licensing agreement was signed by NIOSH-CDC and AES Raptor LLC, North Kansas City, MO. AES Raptor is primarily focused on manufacturing fall protection products for flat commercial-industrial roofs, and in their partnership with NIOSH, their intention was to use the NIOSH guardrail system to establish a presence in the sloped residential construction market. The company did not have their commercial prices available until the end of 2011, however, and to date only one sale has been

made. With the residential housing market still somewhat stagnant, the company is proceeding cautiously.

Highway Work Zone Safety: Division of Safety Research staff for many years have been examining the significant risk of injuries and fatalities that highway construction workers experience while working at the street or highway jobsite. These workers are also at substantial risk of injury from the movement of construction vehicles and equipment within the work zone. DSR researchers designed detailed diagrams illustrating areas around various construction vehicles and equipment that are unable to be seen from the operator's position ("blind areas"). NIOSH provides the blind area diagrams on its website. The Construction Equipment Standards & Regulations Committee of the Association of Equipment Manufacturers (AEM) recently decided to (a) request the AEM publications staff to draft boilerplate language and generic graphics depicting blind areas around classes of construction equipment that are included in AEM safety manuals; and (b) develop an ad hoc group to identify other projects that the Committee can undertake to raise the awareness of workers of the hazards created by blind areas around heavy construction machinery. Furthermore, Caterpillar, Inc. has begun to place blind area diagrams into equipment operator manuals.

Future Plans: A plan will be devised with the NIOSH Division of Safety Research to actively disseminate a pending mobile phone application on ladder safety that has been in development for a few years. Dissemination through the construction falls prevention campaign will occur as well.

The NIOSH Office of Construction Safety and Health plans to review pending and completed research projects to identify several for additional attention and resources. The intent is to further explore options on how the National Construction Center can be used to assess such projects for

RECOMMENDATION 4

The Construction Program Coordinator and the Construction Program Manager should both be devoted full-time to the Construction Research Program.

Background

Status: *Completed*

External Factors: The BSC enumerated several concerns about assignments of several roles to the Construction Program Manager and Coordinator.

In the initial plan presented to the NIOSH Board of Scientific Counselors in August 2009, NIOSH essentially rejected this recommendation altogether, citing the need for Program Managers to assume many roles, and that a “multi-hat” approach had strengths as an “effective management strategy.” The December 2009 BSC response, however, noted that

- The NIOSH response did not adequately address the National Academies recommendation;
- Construction is being given inadequate resources to accomplish its mission;
- Mining has an Assistant Director and full-time facilities in Pittsburgh and Spokane to address a dangerous but much smaller sector;
- Construction research is spread across the Institute. Having the head of the [then] Division of Safety Research as program manager makes it difficult for her to devote the time needed to the program, given all her other responsibilities. The Program Coordinator is primarily full time with this program but this should be acknowledged through creation of a full time position, as recommended by the National Academies report.

Implementation of Recommendation

The NIOSH Office of Construction Safety and Health was established in December 2009 to fully respond to the National Academies’ recommendation.

Description: The director of the NIOSH Office of Construction Safety and Health is also the Manager of the Construction sector program (85%-90% of effort). The deputy director of this Office is the Construction Program Coordinator (100% of effort). Both positions are located in NIOSH’s Washington, DC headquarters location.

Progress: The Program Manager/Office Director provides Institute-wide senior scientific and administrative leadership. Along with the Sector Coordinator/Deputy Director, she ensures that research elements from the National Construction Center are fully integrated, and are included in all designs and plans for research and its implementation. Together the Manager/Director and Sector Coordinator/Deputy Director formulate the strategic vision, the strategic goals, develop

proposals, and implement research plans that ensure that the construction research program is responsive to comments and contributions from emerging research, the National Construction Center, stakeholders, external reviewers, and the NIOSH Director. They actively develop partnerships within NIOSH and among its external stakeholders, and coordinate construction research and related activities among NIOSH divisions, labs and other offices. As well, the Manager of the Construction Sector co-leads the National Occupational Research Agenda (NORA) Construction Sector Council. The range and breadth of representation of researchers, federal and state government agencies, labor organizations, trade associations, and insurance and private industries, makes the NORA Construction Sector Council a true government-labor-management entity.

Impact: Establishing the Construction Program Manager and Coordinator as personnel dedicated to construction activities within NIOSH through its Office of Construction Safety and Health has improved the Institute's ability to align resources with the its national priorities. It has improved coordination among the NIOSH divisions that are conducting research in construction, and improved as well the coordination between those divisions and the National Construction Center. Furthermore, it has improved and enhanced the integration of research conducted by extramural researchers supported through the NIOSH Office of Extramural Programs, including with the National Construction Center.

The personnel decision has led also to better management of the work of the NORA Construction Sector Council. For example, beginning in the summer of 2010, the Manager and Coordinator oversaw the selection of two goals for priority activity from the list of 15 goals for the Sector. All 15 goals are important and relevant; however, making significant accomplishments in all areas within the decade is daunting given budgetary realities and other considerations. The selected goals were Goal 1 (Reduce Construction Worker fatalities and serious injuries caused by falls to a lower level), for which the falls prevention campaign is an intermediate goal; and Goal 13 Increase the use of "prevention through design (PtD)" approaches to prevent or reduce safety and health hazards in construction) for which the green jobs in construction is a component. The selection has allowed the Council to better harness its energies and work collectively to make significant progress and bring research accomplishments to the industry.

Future Plans: The Manager and Coordinator are overseeing a mid-decade review within the Sector Council of the 15 NORA construction goals to determine the likelihood of meeting the goals. Progress on each was assessed, and goals were categorized into:

Exploratory - important issue but still defining problems and solutions

Developmental – some solutions are available but they are not ready for impact

Ready for Impact – sufficient solutions are available and we know what contractors need to do for impact in the industry

Six goals fall into the Ready for Impact category. The Construction Sector Council is reviewing them, and will prepare a mid-decade report.

RECOMMENDATION 5

The National Construction Center should continue to be used as an important component in the Construction Research Program.

Background

Status: *In Progress*

External Factors:

Limits on travel resources at NIOSH make the current location of the National Construction Center in the Washington, DC metropolitan area convenient for frequent and consistent face-to-face and other meetings with the NIOSH Office of Construction Safety and Health, but not for NIOSH staff engaged in construction research at our other locations. OCSH uses several alternative methods for staying in touch with construction stakeholders, including conference calls, and web and video conferences.

Implementation of Recommendation

Description: In its evidence package for the National Academies review, NIOSH described the role of the National Construction Center as a key component of its construction research program. The foci for NIOSH itself are basic research, surveillance, methods research, exposure assessments and controls research. The foci that NIOSH identified for the National Construction Center are industry characterization, applied research (coordinated with but not duplicative of NIOSH intramural research), creating liaisons with the industry, and developing research-based interventions. This scheme is working well. As the construction program has matured over time, in addition to shifting a majority of its r2p activities to the National Construction Center, NIOSH works closely with it to address persistent and emerging problems in the Construction Sector. Research-to-practice elements have been addressed earlier in this report. In an effort to highlight other construction activities at the National Construction Center, a few are noted here.

Progress: NIOSH and the National Construction Center work together in tracking industry trends, in research-to-practice endeavors, as described earlier in this report, outreach to the industry, and efforts related to the NORA Construction Sector Council. For the latter, for example, the Center is playing a substantial role in developing and supporting the construction falls prevention campaign.

NIOSH and the National Construction Center partnered to co-edit and produce a special *Journal of Safety Research* construction issue in 2010 to help commemorate the 20th anniversary of the NIOSH Construction Program.

NIOSH intramural scientists consult with scientists at the National Construction Center or with scientists who are part of its collaborating network (i.e., CPWR Consortium, which is a group of

researchers working collaboratively with or under the auspices of CPWR). In May 2012, the National Construction Center hosted a Tech Transfer Symposium in an effort to facilitate moving laboratory and other research findings on technologies that protect workers to practical application at construction sites. NIOSH researchers, academics, other researchers, construction professionals, and tool and other manufacturers participated in the meeting.

Based on the National Academies recommendation, NIOSH amended its expectations for the National Construction Center so that the role of the Center is strengthened. Specific enhancements in the RFA include:

The National Construction Center is expected to serve as a national leader for the advancement of knowledge and impact in construction safety and health. Accordingly, it is expected to generate, facilitate, and manage hypothesis-driven research that addresses three construction research topic areas, namely the NORA National Construction agenda goals, emerging issues, and tracking and dissemination. The Center is expected to forge strong working relationships through partnerships, many of which would involve stakeholders in research projects and strategic collaboration. The Center is expected to support and coordinate collaboration among researchers and construction stakeholders to implement and achieve NORA National Construction Agenda goals for the nation. The Center is expected to maintain and expand tracking so as to understand emerging trends; track overall industry performance; and track progress towards NORA goals and performance measures.

With these expectations, and the National Construction Center's performance, NIOSH uses the Center as an important component of its Construction Research Program. The Center adds to the NIOSH Construction Research Program's capability to help uncover and adapt to emerging issues.

Impact: Three examples are provided.

Reducing silica exposure and injury. The National Construction Center has supported research by Dr. David Rempel, University of California-San Francisco, designed to reduce physical stress on workers engaged in awkward concrete drilling tasks. They have supported also Pam Susi's work aimed at reducing workers' inhalation of dangerous substances. Laborers engaged in horizontal drilling are at risk of both exposures. A worker engaged in repetitive heavy pneumatic rock drilling can sustain injuries when drilling horizontally the thousands of holes needed for various dowels and rods used in constructing foundations for major buildings, roads or bridges. The drilling process also can fill the air with crystalline silica particles can damage lung tissue when inhaled. Rempel designed a horizontal highway drill jig, and working with Susi and Michael Cooper, outfitted the jig with a shroud around the drill bit and a vacuum system for local exhaust ventilation. This two-way solution reduces impacts on the body, and reduces silica exposure (Cooper MR, Susi P, Rempel D. Evaluation and Control of Respirable

Silica Exposure During Lateral Drilling of Concrete. *Journal of Occupational and Environmental Hygiene* 2012; 9(2);35-41; and <http://www.tandfonline.com/doi/abs/10.1080/15459624.2011.640303>).

Mast scaffolds. The National Construction Center established a work group of representatives from industry, government, including NIOSH, and labor to examine the problems associated with mast climbing work platforms (mast climbers), and to discuss solutions that would improve safety. Mast climbers are power-driven work platforms that climb a vertical tower mast, allowing both work at and carrying larger loads to higher elevations than traditional scaffolds. There are other advantages for contractors to use mast climbers, including that they potentially reduce the risk of shoulder and lower back injuries to workers because the work platform can be adjusted to an optimum height. When installed and used correctly, mast climbers are considered to be as safe as other types of scaffolds. When they fail, however, the sequelae can be tragic, involving multiple deaths and serious injury, but the true rate of deaths and injuries is not well documented. The work group developed recommendations that have been directed to regulators, as well as to parties responsible for specifying and contracting construction work that would involve mast climbers. The National Construction Center published *Reaching Higher—Recommendations for the Safe Use of Mast Climbing Work Platforms* (December 2010); used several venues to disseminate the recommendations, devoted part of their website to the issue; developed partnerships with industry; and presented the report to the OSHA Advisory Committee on Construction Safety and Health (ACCSH). (<http://www.tandfonline.com/doi/abs/10.1080/15459624.2011.640303>).

Lifetime risk of injury and death in construction. Dr. Xiuwen (Sue) Dong, Data Center Director, CPWR, used multiple years of data from several national sources to estimate the likelihood of a construction worker experiencing a disabling injury during a 45-year career. Dr. Dong's analyses showed that there is a 75% likelihood of said injury. She found also that an individual who begins construction work at age 20 years has a 15% chance of developing chronic obstructive pulmonary disease (COPD) over a lifetime. Furthermore, Dr. Dong determined that over the course of a career in construction, the same worker has a one in 200 chance of dying from a work-related injury over a 45-year career (a Hispanic worker has a 20% higher likelihood of dying from a work-related injury). To put this finding in perspective, OSHA considers a lifetime risk of one death among 1,000 workers to be a significant level of risk (Stayner, 1992; Adkins, 1993).

Additional information on projects conducted by staff or sponsored through the National Construction Center can be found at http://www.cpwr.com/highlights/highlight_pdfs/CPWRHighlights2011.pdf.

Future Plans: The National Construction Center is preparing a Silica-Safe website, jointly with NIOSH and OSHA, under the auspices of the CPWR-NIOSH-OSHA r2p work group. The website will contain information on the hazards of silica exposure and on controls, information

which is currently available through a myriad of websites and publications but heretofore not organized well for ease of use. Through this effort, the National Construction Center expects to inform stakeholders of the seriousness of silica hazards and the feasibility of methods by which to control silica dust.

In October 2012, the National Construction Center will host the XXXth International Symposium on Safety and Health in the Construction Industry (<http://www.issaboston2012.org/index.html>), and has invited NIOSH researchers to participate.

Because the enhanced role of the National Construction Center has been successful, NIOSH intends to continue and strengthen this role and structure in future funding announcements for a national construction center.

RECOMMENDATION 6

The Program should establish a closer connection with the Occupational Safety and Health Administration and other regulatory or consensus standards organizations to help ensure that the Program's research is applied effectively in rule-making efforts.

Background

Status: *In Progress*

External Factors: Limited resources and travel restrictions at NIOSH reduce opportunities to meet in person. A key rationale for establishing NIOSH's Office of Construction Safety and Health in Washington, DC was because the location would facilitate frequent engagement with the Directorate of Construction Occupational Safety and Health Administration (OSHA). . Frequent contact with NIOSH staff in other locations is accomplished through telephone calls, conference calls, and web and video conferences. A few times each year, OCSH supports travel to conferences or relevant meetings for NIOSH staff engaged in construction research.

Implementation of Recommendation

In August of 2009, NIOSH responded to the BSC by summarizing the various ways it is working with OSHA and voluntary standards groups, and shared its plans to deepen those relationships in the future. The NIOSH Construction Program believes it has established a closer working relationship with both OSHA and key consensus standards organizations.

Activity A: Directorate of Construction, OSHA

Description: The NIOSH Construction Program works closely with OSHA.

Progress: In January 2010, OSHA installed a new permanent director for its Directorate of Construction, after several years of iterative temporary appointments. With stable leadership at OSHA in place, the NIOSH Office of Construction Safety and Health has been able to meet regularly and plan dissemination of joint efforts with OSHA as it concerns construction.

Preparing for and publishing the NIOSH-OSHA co-branded "Nail Gun Safety: A Guide for Construction Contractors" (<http://www.cdc.gov/niosh/docs/2011-202/>) in September 2011 was an accomplishment that would have been difficult to conceive before 2010.

The Deputy Director, Office of Construction Safety and Health, represents NIOSH on ACCSH, giving NIOSH researchers a voice in formal stakeholder recommendations to the Directorate of Construction and OSHA. In addition, OSHA participates in and presents at NORA Construction Sector Council meetings.

The Deputy Director also participates on OSHA's Federal Advisory Committee for Occupational Safety and Health (FACOSH) Training Subcommittee related to a specific project involving the

Federal Building Personnel Training Act (FBPTA) of 2010. He co-chairs a workgroup to identify core safety and health competencies for stationary engineers and facility managers to ensure that worker safety and health is included as a core competency under FBPTA. Facility renovation and maintenance activities often involve construction workers, and the FBPTA requires that affected workers be able to demonstrate core competencies. The law also applies to private sector contractors working in federal buildings. In June of 2012, the Secretary of Labor sent the FACOSH approved safety competencies to the US General Services Administration for consideration and inclusion.

Impact and Future Plans: By virtue of meeting frequently, a degree of ease and comfort has emerged between OCSH and the Directorate of Construction. Joint dissemination efforts for the Nail Gun Guide and the construction falls prevention campaign have amplified our outreach. For example, by including the Directorate of Construction and OSHA's Office of the Administrator, the Department of Labor Secretary became involved in the launch of the construction falls prevention campaign, thus greatly elevating the profile. We plan to continue meeting and to continue preparing joint efforts as occasion serves.

Activity B: Consensus Standards Organizations

Description: The NIOSH Construction Program has expanded its active participation on the American National Standards Institute (ANSI) Committee on Safety Requirements for Construction and Demolition Operations (ANSI A10), and its affiliated workgroups. This provides an important mechanism for ensuring research to practice. NIOSH participates on standards work groups and provides comments on draft standards. Examples of recent standards with NIOSH involvement or comments include A10.1 (Pre-Project & Pre-Task Safety and Health Planning); A10.46 (Hearing Conservation); A10.10 (Heaters); A10.38 (Basic Elements of an Employer's Program to Provide a Safe and Healthful Work Environment); A10.21 (Safe Construction and Demolition of Wind Generation/Turbine Facilities) and A10.33 (Safety and Health Program Requirements for Multi-Employer Projects). NIOSH is helping to develop the draft ANSI A10.49 (Control of Health Hazards) control banding-based standard for addressing construction chemical and toxic substance hazards.

The Program participates in other ANSI standards as well. For example, NIOSH provided comments to ensure that construction language was included in ANSI TR-Z790.001 (Prevention through Design: Guidelines for Addressing Occupational Risks in Design and Redesign Processes). NIOSH is currently participating in the revision process for ANSI SNT-101 (Safety Requirements for Portable, Compressed-Air-Actuated, Fastener Driving Tools) standard that addresses nail guns. In addition, a number of NIOSH researchers are working with ANSI and ISO standards groups such as A92.9 (Mast-Climbing Work Platforms Subcommittee) and ANSI A10.14 (Ladders).

N.B. Representatives of the National Construction Center also participate in both ACCSH and the ANSI A10 committee, thus providing additional synergies towards meeting this recommendation.

Future Plans: The NIOSH Construction program considers strengthening these relationships as an ongoing activity.

Appendix

National Academies' Recommendations to the NIOSH Construction Program that were Not Selected for Discussion in this Report.

Recommendation 3

High-level attention should be given to determine how to provide program resources that are commensurate with a more robust pursuit of the Construction Research Program's goals.

Background

Establishing the Construction Program Manager and Coordinator as personnel dedicated to construction activities within NIOSH through its Office of Construction Safety and Health has improved the Institute's ability to align resources with the its national priorities. In addition, the creation of the Office has increased coordination across NIOSH divisions and improved collaboration with extramural partners such as the National Construction Center to leverage existing resources to the fullest and to ensure that maximum impact is achieved. Therefore this recommendation was not chosen for Government Performance Results Act tracking purposes.